

**Fixed Permanent Fortifications at The
Operational Level of War**

**A Monograph
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ABSTRACT

FIXED PERMANENT FORTIFICATIONS AT THE OPERATIONAL LEVEL OF WAR
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Throughout history the use of fixed permanent fortifications has waxed and waned depending on the technology and warfare of the day. Several of the forward looking military writers have predicted an increase in the use of fixed permanent fortifications in the future. They believe advances in the technology of sensors and robotics may cause a shift toward the use of fortifications at the operational level. Current Army doctrine and the AirLand Battle Future concept do not attach any operational significance to fixed fortifications. This monograph examines whether the use of fixed permanent fortifications has any value at the operational level in the future.

The following methodology is used in this monograph. First the classical theorists are examined to establish a theoretical framework for the use of forts. Then the historical examples the Maginot Line, the Bar-Lev Line, and DESERT STORM are analysed with respect to the operational design of the use of permanent fortifications. This is followed by an analysis of how new technology will affect the effectiveness of fixed permanent fortifications. Finally, the ten imperatives of AirLand Battle are used as criteria to determine if fixed permanent fortifications have a value for the United States military at the operational level of war. Conclusions are based on the evaluation of the theoretical, historical, and technological review considered against the ten tenets of AirLand Battle doctrine.

The following conclusions were drawn from this paper. The successful use of fixed permanent fortifications at the operational level is viable. Their failure in the past has generally been caused by a lack of understanding of the correct operational design for their use. They alone can not be expected to defeat the enemy without a campaign by a mobile force supporting them.

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1. Introduction.

Military officers are trained not to be objective. They are trained to be biased in favor of the offensive, much as ordinary persons are trained to be biased in favor of virtue.

Bernard Brodie (1)

When most U. S. soldiers think of fixed permanent fortifications they almost immediately think of the ill-fated, or rather ill-remembered, Maginot Line. Because of the recent smashing success of the coalition forces over the Iraqi defensive positions in Kuwait, the use of fortifications at the operational level of war will undoubtedly continue to be viewed with suspicion by military planners. Fortifications in World War II were associated with some of the most spectacular failures of the war; however, the successful uses of fortifications were much more numerous, but not as spectacular. Thus, the "lessons of military history" which support the embracement of offensive action and maneuver stress the failure of fortifications. However, as with most broad brush generalizations a closer examination is warranted. A closer look at history tempered with consideration for changing technology and the possible missions for the U.S. Army will show that it may be too early to discount completely the value of fixed permanent fortifications at the operational level of war.

As the U. S. Army adjusts to a contingency based force rather than a forward deployed one, the use of fixed fortifications may provide useful at the operational level. Currently FM 100-5, Operations, does not mention fortifications anywhere in the manual. No Army manual discusses integration of fixed fortifications into a defensive plan, or for that matter how they should be built.(2) Current manuals only deal with field fortifications at the tactical level. This monograph examines if fixed

permanent fortifications have a viable role in U. S. Army doctrine at the operational level as we move into the 21st century.

In development of this monograph it is necessary to clearly define the type of fortification to be considered. Field fortifications which are constructed as part of the tactical battle even though extensive and possibly at great depth and density are not permanent fortifications. They are only meant to influence the tactical battle. The type of fortifications which have influence at the operational level are those which require extensive engineering work and are specifically designed to be held for an extended period of time. Normally they are built as an integrated defensive system before hostilities begin. Examples would be the Maginot Line, the West Wall, the Siegfried Line, the fortress islands of Iwo Jima and Okinawa, the Bar-Lev Line, and Golan Heights defenses.

Before the reader of this monograph off handedly stops at this point and dismisses this paper as a reactionary response to the true faith of maneuver warfare by one of those engineers who loves to move dirt, let me assure the reader that this paper does not extoll limitless praise for all fortifications. Rather, this paper examines the possibility that there may be circumstances where the U. S. Army should consider how fortifications could be used to influence the operational design of a campaign. Properly constructed and adequately manned state of the art fortifications do not normally fail at the tactical level; however, they often have failed at the operational level.

The recent war with Iraq has shown the impact of advanced technology on the modern battlefield. This dazzling display of percision firepower and sweeping mobility showed the awesome increase in offensive warfare in the open terrain of the desert. But it was against a third-rate power which had totally abdicated the air to the enemy. Several of the forward looking

military writers such as Chris Bellamy and Richard Simpkin contend that in more equally matched opponents this same increase in technology if applied to fortifications will negate the advantages of the offense.

The decisive factor for successful use of fixed permanent fortifications is at the operational level of war not the tactical level. This paper will show that both history and theory indicate that technology will allow fixed fortifications to keep pace with offensive weapons. The key to whether these fortifications are viable is their use at the operational level. The strategic objectives and design of the operational concept used to achieve these objectives will determine if fixed permanent fortifications can be successfully employed by the U. S. Army in the future.

The methodology used in this paper is first to look at the theorists and see what they have written about the use of fortifications. This analysis will show that theoretically the use of fortifications can have an impact at the operational level of war. Also this analysis will show that technology drives weapons development for the offensive and the defensive toward parity at the tactical level; that is, as an offensive weapon is developed a countermeasure will be developed. However, the theoretical development will show the offensive is necessary for decisive results at the operational level. The next step is to look at three historical examples examining the use of fortifications in the operational design and the performance of the fortifications in the campaign against them. The three examples used are the Maginot Line, Israeli fortifications in the 1973 War, and the Iraqi defenses in Kuwait. Finally this paper looks at how this theoretical concept, if correct, impacts on the U. S. Army's doctrine of AirLand Battle by examining its ten imperatives with regard to the possible use of fixed permanent fortifications. From this analysis this paper proposes the

implications of the complete disregard of this means of defense by the U. S. Army.

The significance of the analysis in this paper is not so much a look at this particular subject but rather the impact of a single aspect of the art of war taking predominance in an army's doctrine. The design of a totally offensive oriented army and doctrine will not provide the widest possible range of options for the operational artist to develop the most efficient and effective military operations and campaigns.

II. Classical Theoretical Analysis of Fixed Permanent Fortifications.

Where two ideas form a true logical antithesis, each complementary to the other, then fundamentally each is implied in the other.

Carl von Clausewitz (3)

Fortifications erected during times of peace for protection against invaders are as old as civilization itself. The early forms of fortifications included such colossal feats as the Great Wall of China built to keep out the Mongol hordes and Hadrian's Wall built to keep out the northern barbarians from the Roman Empire. These and other attempts at a continuous, thin linear fortification over great distances have proven unsuccessful against a determined enemy unless it was backed by an adequate army to respond to incursions.(4)

The three classical military theorists who probably have had the greatest impact on the U. S. military doctrine of AirLand Battle are Sun Tzu, Jomini, and Clausewitz. These three appear as the basis for the classical military theory. Therefore, it is of interest to see what they have written about fixed permanent fortifications. Their perspectives on these type of fortifications need to be balanced against their theories on the offensive as developed in AirLand Battle doctrine.

Sun Tzu believed in preparation of the battlefield through maneuvering both military and political forces. In war he moved to develop a superior strategy through a thorough understanding of the enemy. The writings of Sun Tzu reflect the need for decisive offensive maneuver to unbalance the enemy's ability to react which is reflected in U. S. doctrine. He wrote, "Speed is the essence of war. Take advantage of the enemy's unpreparedness; travel by unexpected routes and strike him where he has

taken no precautions."(5) This ancient Chinese military theorist's maxims provide a background of principles which FM 100-5 espouses. They range from the importance of an offensive strategy which defeats the enemy's strategy -- "Thus, what is of supreme importance in war is to attack the enemy's strategy."(6) -- to the maneuver approach of avoiding battle and winning through superior movement -- "Thus those skilled in war subdue the enemy's army without battle. They capture his cities without assaulting them and overthrow his state without protracted operations."(7) Since it is apparent that much of his thoughts on the theory of war are still considered germane today, it only seems proper to examine how the use of fixed fortifications was addressed in his theory of war.

Sun Tzu placed little regard in fortifications. "When I wish to give battle, my enemy, even though protected by high walls and deep moats, cannot help but engage me, for I attack a position he must succour."(8)

However, he did realize that fortifications have their advantages on certain occasions. "The worst policy is to attack cities. Attack cities only when there is no alternative."(9) During his time cities were fortified. He knew that attacks on prepared fortifications were costly. "If the general is unable to control his impatience and orders his troops to swarm up the wall like ants, one-third of them will be killed without taking the city. Such is the calamity of these attacks."(10) His writings reflect little reliance on defense of a fortified position; however, he did not want to meet an enemy he had not prepared for. He must have understood that sometimes denial of a city or the time gained by defense of a city was helpful in the overall strategy of defeating an enemy's weakness.

Sun Tzu's ideas on defense of cities were limited by the technology of the day. While he understood the strength of high walls and moats, his

writings recognize the ability of fortifications to hold out. But, he claims, the ultimate victory will go to the general who maneuvers to the best position and destroys the enemy's will before the battle.

While Sun Tzu's writing did not specifically address the use of forts or fortresses, Jomini had definite ideas on their use. As an observer of Napoleonic warfare he saw two uses of forts. "Forts serve first to cover the frontiers, secondly to aid the operations of the campaign." (11) As Jomini was very perscriptive in his approach, he laid out specifics on both how forts should be used to defend the frontier and how they can assist in operations during a campaign.

The first use Jomini saw for forts was protection of the borders, but he realized that a passive defense was not likely to succeed. He wrote that a fortified place would not normally stop an invading army but only compel the enemy to detach part of its forces or to make detours. The goal of the forts is not to completely stop the enemy but to gain time, reduce his freedom of movement, and provide support to the movement of mobile friendly forces. On an open frontier Jomini's advice is not to to make a continuous line of defense but rather to build a few very strong well-placed forts. The forces to man these forts should not be excessive. The main defense should be a mobile army to orient on destruction of the invading army. Jomini believed that if an enemy is attacking they probably have an advantage in forces. Forts on the frontier should delay and reduce the enemy as the defender builds his forces to attack the invader. Once the defender has had time to build his forces the forts provide their second purpose.

The second purpose given by Jomini was to provide support to the mobile army. He wrote that a solidly held fort provides a secure base to operate

from. Other advantages are anchoring a flank or providing refuge for disorganized forces. During offensive operations he held that a fort can secure the pivots of maneuver or lines of communication. Additionally, he thought that it was advantageous to fortify decisive points. But, Jomini also warned of the pitfalls of over-reliance on large fortifications.

In warning of the dangers of putting too much emphasis in fortresses, Jomini wrote:

However well they may be supported by natural obstacles, their great extent paralyzes their defenders and they are almost always susceptible of being turned. To bury an army in intrenchments, where it may be outflanked and surrounded or forced in front even if secure from a flank attack, is manifest folly. May we never see another instance of it.(12)

He realized that defense from forts or fortresses could not be the decisive operation of a campaign. Additionally, he suggested that the placement of a fortress in the wrong place could be a significant hindrance to an army.

Jomini's thoughts held that fortresses have both positive and negative aspects associated with them. The key, he espoused, was a balance which limited the use of fortresses but still held them as an essential element in the art of war. This is shown by the following quotation:

Formerly the operations of war were directed against towns, camps, and positions. Recently they have been directed only against organized armies, leaving out of consideration all natural or artificial obstacles. Exclusive use of either of these systems is faulty: the true course is a mean between these extremes.(13)

In Jomini's theory of war fortresses could be used to improve the defense initially as mobile forces use the time to concentrate and maneuver. Additionally, he held that during offensive operations an army could use fortresses to defend key decisive points to support the army as it maneuvers.

The last theorist to examine is Clausewitz. He devoted two chapters in Book Six "Defense" of his classic On War to discuss the role of fortresses and their placement. His discussions on fortresses are much more indepth and specific than even Jomini. Clausewitz lists and explains eleven ways in which fortresses support the defense. These ways are:

1. As secure depots.
2. As protection for large and prosperous towns.
3. As real barriers.
4. As tactical points of support.
5. As a staging post.
6. As a refuge for weak or defeated units.
7. As an actual shield against an enemy attack.
8. As protection for extensive camps.
9. As cover for an unoccupied province.
10. As a focal point of a general insurrection.
11. As a defense of rivers and mountain areas.(14)

Clausewitz placed great importance on fortresses in the defense. He wrote: "Without fortresses, an army on the defensive is vulnerable everywhere. It is a body without armor."(15)

Clausewitz saw fortresses as having both an active and passive function. The active function entailed the use of forces from within the fortress to attack an enemy as it approached and the passive function was protection of the fortresses and its contents. In keeping with his ideas on the best defense being a shield of well directed blows, Clausewitz felt that the active functions was the most important even for a fortresses with a small force. He wrote: "Strictly speaking, even the most passive function of a fortress, defense against assault, cannot, after all, be imagined without its active element."(16) Because he thought a fortress garrison was limited in the operations they could conduct against an enemy's field army, he suggested that an independent corps operating in conjunction with a fortress could greatly extend the influence of a fortress.(17)

In his discussion on the question of whether fortresses should only be

on the frontiers or built in depth, Clausewitz strikes to the heart of the matter. What is the value you are seeking to gain from the use of a fort? If it is chiefly to gain time until outside help is available, then the defense is designed not in destruction of enemy forces but rather to force a slow down of the enemy's advance. He writes, "It is not a vigorous counterattack, but rather a drawn-out process in which the advantage lies more in gaining time than in reducing the enemy's strength." (18) With this aim in mind, Clausewitz believed that fortifications in great depth were necessary to defeat the enemy through lengthening his line of communications and threatening these lines should the fortification be bypassed.

In his discussions on forts Clausewitz did not wish to convey the idea that the proper defense is always forts on the frontier and in depth. He merely addresses the proper use and advantages of forts should the situation and geography support their use. He writes in regards to fortifying a country:

We feel justified in claiming to have based it on important and permanent considerations directly related to the vital affairs and interests of the state. It is, in consequence, immune from transient military fashions, flights of ingenious strategy, or the special needs of a given case - any one of which could have unhappy consequences for a fortress built to last five hundred or even a thousand years. (19)

Clausewitz addresses not only the defender view on fortresses, but also discusses attacks on them. He views the decision to attack a fortress as a strategic one. Although he uses the word strategic this can be equated to our operational level. He writes: "During the crisis itself, besieging a fortress increases the problems of the attacker." (20) He felt that a fortress could be the aim in a limited objective campaign. Therefore, use of fortresses could be influenced by not wanting to provide a potential attacker with such a target. His final point to attackers of fortresses is that the best method for use of forces during a siege is as an army of

observation rather than for circumvallation.(21) The key to reduction of a fortresses is to attack the force which can relieve it.

From this quick look at these three preeminent classical theorists, I see the development of a distinct theory on use of forts and fortresses. The most important element of this theory is that the use of fortresses alone can not be decisive. In developing a defensive campaign against an invader the defender can not rely on his fortresses to defeat the enemy. The only advantage in defense that a fortress used alone can provide is additional time through delay of the enemy advance. And this will be provided only if the forts are located properly.

The proper use of forts in the defense in this theory is a base upon which mobile forces maneuver to attack the enemy forces. The use of forts must include both a passive and active function. The strength of the fort must provide the passive portion and mobile forces must provide the active function. This active and passive tandem must be used even when the fortifications are being used in their defensive role to gain time. The active portion must be used at both the tactical and operational level. The use of active mobile forces must be an intergal part of the defensive scheme of the fortifications.

The final element of the theory on use of fortifications is their use in the offensive once the defender has gained the necessary time to begin a decisive offensive campaign to defeat the enemy. If properly positioned they can provide secure lines of communication. The fortifications can set the stage for the offensive campaign. This is accomplished by providing secure locations for the assembling of forces and storage of supplies.

Within this theoretical framework it is now necessary to look at some examples in history of the use of fixed permanent fortifications at the

operational level. The synthesis of these three classical theorists ideas on use of forts and fortresses provides a framework with which to examine the use of fixed permanent fortifications at the operational level. And to see if their principles hold true for fortifications just as our doctrine assumes their principles on offensive operations are valid.

III. Recent Performance of Fixed Permanent Fortifications.

The arguments for permanent or semi-permanent fortifications, in combination with powerful, mobile reserves, are persuasive for anybody needing to buy time from a numerically superior attacker.

Chris Bellamy (22)

As pointed out in the introduction to this paper, many feel that the lesson of history is that a campaign that depends on fortifications is doomed to failure. This section examines what is considered to be the most damning historical example of the futility of fixed permanent fortifications -- the much maligned Maginot Line. After examining its failure in light of the theoretical framework established in previous section of this paper, it is necessary to look next at the performance of the fortifications used by the Israelis in the 1973 Arab-Israeli War. This provides a balance of how fortifications were effectively used. Lastly this section examines the failure of the fortifications prepared by the Iraqis in Kuwait.

The one fact that is seemingly always overlooked in discussions on the Maginot Line is that it did exactly what it was designed and expected to do. It kept the Germans from invading along the shortest most vulnerable route into France. The aim of the line was to provide time for the French army to mobilize. Once mobilized it would provide operational reserves for the Maginot Line and an army to take the fight to the German Army which was sure to come through Belgium as they had done during the First World War. The French knew that their population base could not match that of Germany. They needed something to offset the German's manpower advantage. Historically strong defenses have provided the defender with the ability to hold with fewer forces than the attacker has. The defenses of the Maginot

Line provided a secure southern frontier for the French Army to anchor their operational maneuver on.

The French plans for defense failed because they thought the Ardennes was impassable to armor forces. The mobile portion of the French army did not react quickly enough to the German penetration between the French forces in Belgium and northern France and their forces assigned to the Maginot Line. The training, doctrine, and organization of the French Army failed to provide a force capable of defeating the German style of warfare.

This failure is linked by many to the effect the construction of the Maginot Line had on the French military. The cost of the fortifications was excessive. It cost more than estimated and did not cover as much of the frontier as originally envisioned. The fortifications were a technological wonder. They incorporated the latest technology available. And the designers developed new technology when a need was identified. As with many ambitious projects of this scale, the Maginot Line consumed so much money and energy there was little left over for anything else. And a half completed fortification does little more than no fortification, particularly for a linear defense. As a result the maneuver functions of the French military were squeezed to provide funds for construction costs. In particular the French Air Force was neglected until it was too late to counter modernization the German Air Force.(23)

The mistake the French made was planning to use a fortification not to delay the enemy but to completely stop him. This forced the building of such complex structures and system to support them that cost became a significant factor. As the fortifications took on a requirement for invincibility, the fortifications had a psychological effect on both the French nation and Army. Alister Horne in To Lose a Battle wrote:

Rapidly the Maginot Line came to be not just a component of strategy, but a way of life. Feeling secure behind it, like the lotus-eating mandarins of Cathay behind their Great Wall, the French Army allowed itself to atrophy, to lapse into desuetude.(24)

The underground forts complete with overpressure protection from poison gas and remotely fired artillery were a tactical match for any attacking army.

The French understood the tactical requirements necessary for successful permanent fortifications. They had learned the lessons of static warfare during World War I. They recognized the defects of Verdun forts and included underground protection for movement of reinforcement troops and the addition of depth to the defense through feste type works. This involved the positioning of both armored and open artillery batteries and numerous but separate infantry positions all connected by underground passages forward of the main defensive casements. Thus the fort was not a monolithic structure but rather a piece of defended real estate. The defenses were completely embedded into the ground and presented a minimal target.(25)

The fortifications of the Maginot Line were never defeated by the Germans. The fortifications forced the Germans to attack at a different location. However, the Maginot Line was a failure because it did not stop the Germans from defeating the French Army. The cost required to construct near impregnable fortifications which were completely self sufficient was too much. This defensive passive approach on the southern frontier affected the conduct of the French defense. By forcing the Germans to take a different invasion route the fortifications allowed them to take the initiative in an area which completely surprised the French. Their mobile forces were unable to contain the German offensive through the Ardennes

and the forces within the Maginot Line were unable to be shifted to foil the German thrust. The only part of the French strategy to succeed was the holding of forces by the Maginot Line.

The operational design of the French defense failed. While the excessive cost and psychological effect of the construction of the fortifications may have added to the factors which led to defeat, the collapse of the French Army can not be blamed on the use of fixed permanent fortifications. The reasons for the defeat were much deeper and wide-spread. However, Alister Horne contends that had the German armored thrust through the Ardennes been blunted the battle for France may have had a different outcome. He wrote:

For all its impressiveness, the Wehrmacht of 1940 was a more fragile instrument, less consistently solid throughout, than the Kaiser's Army of 1914; nor did it have the same weight of resources behind it. On almost every occasion when Allied troops in 1940 came up against the ordinary infantry divisions which compromised the great mass of the Wehrmacht, they held their own. Acutely limited in their fuel supplies, the Panzers could not have fought a protracted campaign without a major reorganization. Then there is the prime consideration of the steadfastness of the German High Command, about which much has already been said... What, then if the steel tip provided by the few Panzer and motorized divisions could have been blunted, the nerves of the German High Command shaken by one sharp reverse?(26)

If the fortifications of the Maginot Line not been so expensive it might have been longer and been able to include some fortifications in the Ardennes area. As scattered American units proved during the Battle of the Bulge in 1944 the Ardennes is very easily defended terrain. Therefore, the use of fixed fortifications might have proven effective had the French designed a better operational design to defeat the German forces.

In the final analysis the Maginot Line had very important operational value upon which to anchor a French defensive campaign. However, the

French Army payed too high a price for this anchor which became a millstone around its neck. By attempting to build a fortification which would defeat the enemy rather than delay for time the Maginot Line failed at the operational level. The Maginot Line relied too heavily on passive defense at the operational level. Although at the tactical level it had active functions in the form of local reinforcement, it did not have sufficient operational reserves to deal with the German thrust through the Ardennes. At the operational level, the mobile forces had been committed to a defense in Belgium. The lesson is not that fixed permanent fortifications failed but rather the operational design for their use was flawed.

Even the Israelis, the champions of maneuver warfare, used fixed permanent fortifications very successfully during the 1973 Arab-Israeli War. Following the Israeli capture of the Sinai in the 1967 war, Israeli Lieutenant General Chaim Bar-Lev ordered the construction of fortifications along the Suez Canal.(27) It was planned as a light defensive belt and observation post rather than a major line of fortifications. The fortifications provided vital protection because the Egyptians regularly shelled the Israeli forces in the Sinai between the 1967 and 1973 wars. Major General Chaim Herzog, the Israeli Chief of Intelligence, wrote that in spite of intensive Egyptian shelling, "the Bar-Lev line had very successfully withstood the battering it had received and had vindicated the hopes of its planners."(28)

The fortifications effectively protected against the Egyptian shelling; therefore, the line was repaired and expanded in 1970. A second line which include a sandwall and road was added seven kilometers to the rear to give cover to the Israeli artillery and tanks supporting the front line.(29) However, only 26 fortifications were built along the 150 kilometer Suez

Canal front. These fortifications were very dispersed. Each controlled about one half to two miles on each side and about seven miles separated each fortification. They were built for a force of only about 15 troops.(30) They were not mutually supporting, easily bypassed, and lightly manned. But the Bar-Lev Line fortifications were well constructed. The forts were several stories tall and blast-proof with concrete slab roofs supported by steel rails taken from Egyptian railroad lines. These block houses were further protected by the steep bank of the canal, barbed wire obstacles, and minefields.(31) There were some other fortified structures, but not all were large or complex fortifications. A sand barrier about twenty meters high was built along the canal to slow any Egyptian crossing attempts. Including the cost of the minefields and some underground headquarters, approximately forty million dollars were spent on fortification construction.(32)

Almost all the forward tanks and forces were behind this line of warning fortifications. The major purpose of the fortifications was to protect the observers. As fighting on the Suez Canal subsided during 1972 the manning of the forts was reduced and ten of the 26 were abandoned and filled with sand.(33)

That was the disposition of The Bar-Lev Line prior to the Egyptian attack in 1973. Most Egyptian attacks were successful the first day of the war. The surprise and speed with which the Egyptians attacked should have eliminated all the fortifications but they were not destroyed. The fact that all were not eliminated is very strong testimony to the strength of a fortified position with determined defenders. A major benefit of the fortifications was the valuable information they gathered on Egyptian activities. Their communications "provided a clear picture of what was

going on in every strongpoint along the Canal."(34)

The Israeli fortifications were not completely overrun by the vastly superior Egyptian forces. Many continued to hold out for days despite being cut-off and greatly outnumbered.(35) Because of the excellent defensive protection they offered, the forts survived because they were too costly for the Egyptians to knockout.

When the Israelis recovered and began their counterattack, the surviving fortifications supported the effort. The Egyptian Minister of Information, in describing General Sharon's counterattack, wrote that "an Israeli strongpoint on the Bar-Lev line . . . at the point of Sharon's main crossing . . . was able to give great assistance to the crossing of Israeli troops."(36) This became the active part of the defense with mobile forces which had been provided time to mobilize.

The fortifications did not stop the Egyptians from crossing the canal, and their use could therefore be pointed to as a failure. However, that was not their intended purpose. They provide warning and delay of the enemy until the operational reserves could be mobilized and committed to the attack. Even though very lightly manned because of the holiday period the Bar-Lev line still provided enough of a delay for the Israelis to react.

Israeli fortifications on the Syrian front also proved valuable in defense and helpful in overcoming logistical problems. An Israeli officer explained the value of "fortified tactical localities"(FTLs):

FTLs are well stocked with combat supplies overcoming logistic problems in the battle, and proved extremely successful in the Yom Kippur War, enabling the Israelis to hold off odds of 6 or 10 to 1. In three days of fighting in the Valley of Tears alone, the Syrians lost 500 AFVs on the obstacle line. As a result the IDF is reported to have built a double line of FTLs on all of Israel's frontiers.(37)

The defensive fortifications in the Golan Height area were 17 well defended

lookout posts along a 45 mile front. Each was manned by approximately 20 men and supported by a platoon of three tanks behind an anti-tank ditch.

(38)

The impressive point of the Israeli use of fixed fortifications is that relatively small amount of manpower and equipment held out against overwhelming odds. The two defensive lines were successful because they provided the delay necessary to allow the mobilization of Israeli reservists. Those manning the fortifications had to fight with determination and courage but the required time was made available. The operational design of the defense effectively used the fortifications to support it. The defense did not rest on fortifications alone but on a mobile force which used the fortifications to anchor their maneuver. The Israelis could not politically accept trading space for time in a mobile defense. The limited space available to them had to be used effectively. Additionally, the Israeli government could not afford to spend large amounts on fortifications. Therefore, the use of fortifications by the Israelis during the 1973 War shows how fixed permanent fortifications can be effective if the operational plan is sound in its use of fortifications.

The skeptic will say that this was almost twenty years ago and the most recent use of fortifications by the Iraqis in Kuwait provides the fallacy of fixed fortifications. However, I contend that it was not the failure of the fortifications but rather the operational design for their use that failed. The Iraqi campaign was designed to be totally passive defense with the active function which the theoretical framework developed in Section II of this paper requires. In setting an operational goal which had only death of American soldiers as its goal the Iraqi Army did not have a decisive aim. Fixed permanent fortifications designed to guard a frontier must be

supported by a mobile army which is large enough to be decisive. The bulk of the Iraqi forces were in the fortifications. Even if the mobile armor forces had been able to move on the battlefield in the face of our air supremacy, they were only part of the tactical level battle, representing a counterattack forces.

If Iraqi soldiers had fought more vigorously the fortifications would have been undoubtedly more effective at the tactical level. The U. S. planners expected a better tactical showing of defense of the fortifications. However, the operational design of Coalition forces campaign plan defeated the operational use of the fixed fortification. The effective use of fortification requires more than an operational reserve to counterattack breaches of the line. The major combat forces of the the defender must be able to be focused against the enemy force and not be tied to the fortifications. This allows decisive maneuver to defeat the enemy army.

As shown in the development of the theoretical framework in section II of this paper, if the operational design of a campaign is for fixed permanent fortifications to destroy the enemy force it will fail. At the operational level of war fortifications should only be used to slow an enemy in order to provide time. The Iraqis were depending on the fortifications they built to provide the decisive element of their campaign. In doing this they sealed their fate. Even if the fortifications had been vigorously defended the operational concept was flawed. The success for the U. S. led coalition forces would not have been as dramatic but it would have succeeded.

These three examples are not meant to be all inclusive. Yet, they illustrate how it is not at the tactical level where use of fixed permanent fortifications cause failure. If the decision is made to build fixed permanent fortifications, the operational design of the defensive campaign

is as important to success as the strength of the works. However, in order for fixed permanent fortifications to be successful when the correct operational design is used they must be successful at the tactical level. Therefore, it is necessary to look at how changes in technology have affected the effectiveness of fixed permanent fortification.

IV. The Impact of Technology

The bias toward the offensive creates special problems in any technologically new situation where there is little or no relevant war experience to help one reach a balanced judgment.

Bernard Brodie (39)

As pointed out in the introduction to this paper many feel that the lesson of history is that a campaign that depends on fortifications is doomed to failure. The idea that fixed fortifications are obsolete is not a new idea. A historical example is Europe prior to the First World War. Most armies of that era believed high explosive shells, better artillery and mass armies had negated the significance of forts and fortresses. And the performance of German artillery in the opening stages of the German offensive of 1914 against the Belgian forts at Liege and Namur seemed to show they were correct. The French then removed guns from the existing fortifications around Verdun which had been built during the same time as the Belgian forts. However, the French found that the supposed outdated fortifications which were being used only as a shelter for troops could withstand even the largest artillery that the Germans had. Where the Belgian forts had been constructed of a solid block of concrete, the French in the 1880's had modified these forts when high explosive shells had been introduced. They had added a layer of sand and an outer skin of concrete. These modifications worked better than the French generals anticipated. They assumed that their forts would fare no better than the Belgian forts. In 1916 when the German offensive began in the Verdun area it was found that these fortifications were capable of withstanding the impact of shells up to 420MM. The French rearmed them and they played a crucial part in

defeating the German offensive.(40)

For fixed permanent fortifications to have a value at the operational level of war they must be effective at the tactical level. In order to determine if fixed fortifications have been rendered obsolete, it is necessary to examine whether technological advances have given an insurmountable advantage to mobile weapons effectiveness. A fort must be able to survive a determined assault by the enemy. This is done by providing protection to the defender while he inflicts damage upon the attacker. The primary disadvantage of fixed fortifications is their static positioning. Once detected they must be able to absorb any firepower used against them. They have the advantage of not being limited by weight or material restrictions. A mobile system, such as a tank, relies on its mobility as a means of protection, therefore its construction is limited by weight. This physical relationship provides the fundamental reason why permanent fixed fortifications can offset the capabilities of high-tech maneuver oriented weapon systems.

Great strides have been made in developing lightweight materials which offer superior ballistic protection. Yet, when weight is not considered as a factor, soil and reinforced concrete provide excellent protection even against nuclear weapons. Drew Miller in his doctoral thesis at Harvard argued for the use of underground nuclear shelters and field fortification as the defensive plan for NATO. He wrote:

By the simple expedient of positioning several feet of earth between troops and nuclear detonations, chances of survival can increase by more than an order of magnitude. Particularly with underground nuclear defense shelters, survival on a nuclear battlefield, even near multiple and fairly close explosions, it is not only possible but very probable.(41)

An idea of the strength of well constructed earth and concrete fortifications

is shown by Anthony Kemp in his book about the battle for Metz in World War II. The Germans had built the forts around Metz between 1870 and 1914. When Patton's dash across France was halted by logistic problems the Germans were able to man the forts and defend from there rather than fall back on the Siegfried Line. The author noted in an appendix on the performance of these thought to be outdated forts:

What does emerge from the foregoing is that the Metz forts were able to withstand a tremendous amount of punishment, including air bombardment, that was not envisaged by the engineers who designed them. The author has explored many of the forts, and the only serious damage that can be seen is demolition subsequently carried out by engineers.(42)

The strength of a static position will always have the advantage over a mobile system because it is not limited by the restriction of weight and the need for a power plant to move it.

The lack of very heavy artillery such as the siege weapons of World War I and II means that strongly constructed fortification will have to be reduced by air attacks. And this can be an advantage for a force which can provide adequate air defense over its fortifications. Hardened air defense in prepared fortifications which can reduce the accuracy of air attacks would reduce the need for air superiority by the defender. As demonstrated during the OPERATION DESERT STORM precision guided munitions can have a devastating effect on a target that can be pinpointed and has little or no air defense. However, if there is an adequate air defense system which is hardened and protected by retractable launchers with hardened fiber optic communications from dispersed and hidden acquisition sites, the efficiency of these air deliver munitions will not be nearly as effective. Even with our complete air supremacy, the simple field fortifications and expedient protection techniques of the Iraqis required many thousands of

sorties to reduce. And even then, there was not total destruction of the fortifications. If the Iraqis had been able to stand and fight, the fortifications remaining would have still caused the infliction of many casualties and slowed the attackers. Obviously fortifications can not make up for surrendering the air completely to the enemy, but with fixed permanent fortifications, which employ available technology appropriately, it is possible to offset an attackers air force with hardened air defense sites. This must be possible or the Navy's aircraft carriers will not survive the next war.

Modern technology can be used to enhance the ability of fortifications to allow economy of force. The use of forts as an economy of force measure can be made more effective by the use of robotics. With current sensor technology combined with robotics a small number of well protected technicians could defend relatively large defensive sectors. These type of fortifications would be limited only by cost. (Which was one of the downfalls of the Maginot Line.) Richard Simpkins wrote in Race to the Swift:

Finally, I have put down some markers on robotics and static unmanned systems in land warfare, contrasting that technology's limited value for mobile systems with its great promise for static ones.(43)

The use of remotely controlled fully automated fortifications will certainly only be available to those with the technological infrassructure to support and maintain it. But as the performance of the high-tech weapons during DESERT STORM showed they can and do work. Chris Bellamy wrote in The Future of Land Warfare:

The trend, certainly in developed countries, will be to exploit technology to multiply the capabilities of human being and save manpower. Artificial intelligence, particularly robotics, will be used to fulfil [sic] mechanical or arithmetical functions.(44)

Both Bellamy and Simpkins see advances in technology not only increasing the advantages of the offense but also of the defense.

Some of these new technologies could provide an advantage to fixed permanent fortifications before they can be developed for mobile systems. In particular, direct energy weapons (lasers, radio frequency weapons, high powered microwaves, and particle beams) may prove a technology useful only in these type of defenses until technological breakthroughs are discovered. Not having the limits imposed by the weight restrictions of a mobile system, fixed permanent fortifications can overcome the the size and weight limitations of the power sources required for a successful direct energy weapon.

Smart munitions are not limited only to explosives delivered by aircraft and artillery. The addition of the microchips to minewarfare has made the pressure activated mine an even more deadly adversary. The current technology available has mines capable of standoff detection and engagement capabilities which attack targets from the top and can be delivered by remote delivery systems. These mines are capable of communicating with their employing unit and describing the target being detected and engaged.

(45)

The ability to harden communications and use underground cables increases the ability to use fortifications effectively. The effects of electromagnetic countermeasures (ECM) can be negated. Even the electromagnetic pulse (EMP) from a nuclear explosion would not effect fiber optic communications. If the defenders of a fixed permanent fortification have the advantage of uninterrupted communications, they will have a marked advantage in responding to the attackers advantage of initiative. At the same time the defender could employ his own ECM more vigorously

knowing that it will not be interfering with his own communications. Therefore, command and control would be much easier for the defender than the attacker. The defender of a fixed hardened site can better use computers and link with national intelligence assets even when under attack.

Finally, with the advantage of time to prepare and without the limitations imposed on mobile systems, fixed permanent fortifications can provide better protection to its defenders. The Maginot Line had overpressure protection from poison gas attacks. Any fixed permanent fortification built today could provide even better protection. Those which incorporate nuclear shelters would be effective against tactical nuclear weapons. Properly compartmentalized construction can reduce the effectiveness of precision guided munitions by requiring multiple hits to destroy a structure. Hiding everything with earth reduces the ability to pinpoint vulnerable attack points for smart bombs.

The discussion in this section on technology is to show the reader that technology is a two edged sword. As Clausewitz wrote:

If the offensive were to invent some major new expedient - which is unlikely in view of the simplicity and inherent necessity that marks everything today - the defensive will also have to change its methods.(46)

The European generals prior to World War I felt that advances in technology had added more to the power of the offensive than the defense. However, they found that when the momentum of the maneuvering armies was slowed those same weapons combined with fortifications were even stronger. While our Army crows about the success of its high-tech weapons and ridicules the static positioning of the Iraqis, it should be tempered with the fact that this same technological superiority if applied to fixed permanent fortifications would prove a match for the attacker. Fixed permanent

fortifications are tactically viable on the future battlefield. The awesome display of high-tech weaponry in DESERT STORM can be matched on the defense given adequate time and money for preparation. The question is now whether with these restrictions that the at the operational level of war they can be effectively utilized.

V. Analysis of Permanent Fortifications at the Operational Level of War.

History shows again and again that a combination of resistance and mobility -- of shield and sword -- is the true answer to mass.

J. F. C. Fuller (47)

In order to analyze correctly the use of fixed permanent fortifications at the operational level of war it is necessary to explain what this level of war is. The operational level is the bridge between strategy and tactics. It is the level characterized in FM 100-5 by operational art. "Operational art is the employment of military forces to attain strategic goals in the theater of war or theater of operations through design, organization, and conduct of campaigns and major operations." (48) It involves the fundamental decisions about when and where to fight and whether to accept or decline battle. Therefore, if a substantial fixed permanent fortification is built during peacetime which can influence the conduct of the campaign required once hostilities begin, then these fortifications have an impact at the operational level.

The classical theorists, examined in the theory section of this paper, believed permanent fortifications had a strategic effect prior to hostilities. The strength of a country's forts had an effect on that country's strategic defensive strength. However, the theoretical framework established in section II of this paper holds that once hostilities begin fortifications must be used in conjunction with mobile forces to attain a decisive victory. The forts will provide the defender time by delaying the enemy and with a base upon which to begin his counteroffensive phase of the campaign.

The analysis now focuses on how a line of fortifications or a fort can assist in the design of a campaign. The U. S. Army will be transitioning to

an army of forward presence and relying on power projection when called upon. The possibility may arise where enough warning time is available to construct permanent fortifications in the theater. For example, suppose the situation in the Persian Gulf had been different and the strategic decision by the United States had been only to defend Saudi Arabia with a long term commitment of ground troops and air forces. The decision could have been made to reduce the size of the force in Saudi Arabia and defend key installations and airfields which would serve as a lodgement to flow in reinforcements. If this would have happened the size and scope of the permanent fortifications would have had an impact at the operational level. The operational design of such a defensive campaign should take into account the lessons of history and theory. The development of the ALB doctrine recognizes the importance of operational art. Therefore, a good basis for a decision as to whether permanent fortifications can be effectively used at the operational level is to examine them using the criteria of the ten imperatives of ALB.

Ensure Unity of Effort

The use of fixed permanent fortifications can help to focus the effort by developing the situation. The fortifications can convince the enemy to go somewhere else as with the Maginot Line or determine the enemy point of attack as with the Bar-Lev Line. Unity of effort may be hampered if relief of the forces in the fortifications is required and the relief operation does not contribute to the main effort. Therefore, as shown in the theoretical framework, the operational design should not focus on the fortifications being the decisive element for destroying the enemy force. An enemy attack on a fortification requires a concentration of assaulting forces so that this force becomes a center of gravity against which the friendly effort is

focused.

The location of the fortifications will determine if they support unity of effort. If the fortifications do not control an area the enemy must control in order for their operation to succeed, these fortifications will not support unity of effort. During DESERT STORM the Iraqi defenses were not located where we had to go in order to succeed in the operation. Therefore, while the Iraqi fortifications forced the allied main effort away from them, the operational design of the Iraqi defense did not use this circumstance to their advantage. The fortifications did not contribute to unity of effort because once the frontier fortifications were outflanked, the forces in them could not contribute toward an Iraq success.

Anticipate Events on the Battlefield

Many feel that this is where fortifications limit the defender. For example, the British prior to World War II fortified Singapore from attack from its seaward approaches. They felt that an attack through the jungles by land was impossible. The Japanese proved them wrong and Singapore was easily taken from its unfortified rear. Singapore was doomed because it had only a passive function. Its air power was insufficient and naval support was not available to give it an active function.(49) If a fortification has only a passive function it is difficult to anticipate the enemy's actions. Yet, a successful defense is possible using fortifications if the defender can force actions which the enemy must react to and the defender can successfully predict the enemy's response.

The use of fortifications can add some certainty to anticipating events on the battlefield. Permanent fortifications because of their nature are much stronger than temporary field fortifications. They are designed to absorb much pressure and still hold. Therefore, when attempting to

anticipate events on the battlefield an accurate evaluation of the enemy's plan of dealing with the fortifications should be known with some certainty. Just as the French correctly anticipated that the Germans would not attempt to launch their main attack through the Maginot Line.(50) The ability to depend on a secure flank or base of operations aids in anticipating events on the battlefield. Any attempt at assaulting fortifications requires some concentration of forces by the attacker. If intelligence gathering is accurate this provides an element for anticipating events. The outposts in the Bar-Lev Line, which survived, provided intelligence which helped the Israelis anticipate the Egyptian actions.(51)

Concentrate Combat Power Against Enemy Vulnerabilities

As the enemy assaults a fortified area he will have the advantage of choosing the place of attack. This means he has a better opportunity to attack vulnerabilities. No one wants to attack into an enemy's strength. Therefore an enemy will accept risk to maneuver away from that strength. The use of fortifications can therefore expose an enemy vulnerabilities by forcing him to maneuver. During DESERT STORM the Iraqi fortifications caused the allied forces to attempt a wide flanking maneuver to avoid them. This exposed a vulnerability to the Iraqis - a weak front. Obviously with our complete air supremacy and the Iraqis lack of intelligence this was not much of a risk. However, in different circumstances had the Iraqis been able to mount an attack against the weakly defended front they could have unhinged the flanking movement by cutting the V and VII Corps lines of communications.(52) Here again is an example of how the theoretical framework for using fortifications shows that an active function is required if fortifications are to be successful.

The design of fortifications must concentrate their combat power toward

enemy vulnerabilities. The vulnerability of the attacker is that he must mass at the point of attack to ensure a successful breakthrough and have sufficient combat available close at hand to exploit success. The design of fortifications must allow him as little natural protection as possible while massing sufficient firepower to punish him for concentrating. A highly mechanized force which depends on mass and speed such as the Soviets does not want to be slowed by fighting through fortifications.(53) Fortifications can expose vulnerabilities which the campaign plan for the mobile forces can concentrate combat power against.

Designate, Sustain, and Shift the Main Effort

At the operational level, well stocked and properly maintained permanent fortifications will support this imperative. Since the theoretical framework developed for proper use of fortifications at the operational level says that fortifications can only delay and thereby provide time, the main effort should be to establish the operational level force which will provide the active function of the defense. Therefore, the fortifications must not depend on excessive additional support to accomplish their mission. An advantage of permanent fortifications is that the time and resources have been devoted to them prior to the conflict so that they do not detract from the resources needed by the mobile forces once the conflict begins.

Another advantage of permanent fortifications is that once the mobile forces have begun the offensive campaign the fortifications can be used as a secure base of operations around which the main effort can be shifted if required. The Israeli use of "fortified tactical localities" discussed in section III (page 21) of this paper is a good example of this concept.

Press the Fight

This imperative is a difficult to attain at the operational level with

permanent fortifications alone. Although at a tactical level counterattacks from the defenders of the fortification may press the enemy, at the operational level the fortifications can not press the fight. However, the genesis of the theoretical framework is that at the operational level the fortifications eventually must be supported by the actions of a mobile force which presses the fight.

Move Fast. Strike Hard. Finish Rapidly

At the operational level fortifications can support the mobile forces in accomplishing this imperative. Permanent fortifications should have superior communications and intelligence gathering capabilities. They can provide not only a logistics hub to facilitate maneuver, but also enhance command and control for the operational commander as he maneuvers his mobile forces to accomplish the tasks necessary to allow his force to move fast, strike hard, and finish rapidly.

Use Terrain. Weather. Deception. and OPSEC

The entire focus of fortifications should be to use the terrain to the defenders advantage. A properly constructed permanent fortification uses terrain to reduce construction costs. At the operational level permanent fortifications can use all these to provide the defender an advantage. A permanent fortification can employ all weather ground sensors which deny the enemy freedom of observation from overhead systems during poor weather. Permanent fortifications can support deception and operations security. Troop movements and level of manning can be hidden from the enemy and secure land line communications provide OPSEC. The support of an operational level deception plan can be supported by permanent fortifications because the enemy will usually pay particular attention to the activity surrounding a fortification.

Conserve Strength for Decisive Action

Permanent fortification can support a commander's attempt to ensure this imperative is followed. Through the use of robotics and other advanced technology this function may be even better able to conserve those forces best suited for mobile warfare. As early as 1836, Dennis Hart Mahan, the West Point instructor who influenced a generation of military officers, wrote that the best policy for the use of militia was to man permanent fortifications. He felt the regulars could then be used as a mobile force for aggressive action.(54) This could be applied to use of National Guard and Reserve forces today. The increasingly difficult skills required on the modern maneuver oriented battlefield are making it harder to keep Reserve units combat ready. However, it should be relatively easier to prepare a unit for fighting from permanent fortifications.(55) Under current conditions the use of light forces placed in permanent fortification could take advantage of their strategic mobility while minimizing their lack staying power against armored forces.

Another advantage permanent fortifications provide to support this imperative is that they can provide protection and time to assemble a force large enough to have an impact at the operational level. Without fortifications forces might have to be committed piecemeal just to retain the necessary lodgement. This was the reason for the lines of forts on the frontiers of European countries until World War II. The use of mass armies required time for the mobilization of reserves. Today for a contingency army, time is required to get the forces to the theater.

Combined Arms and Sister Services to Complement and Reinforce

Permanent fortifications make integrating combined arms and sister services easier. One of the most difficult problems of synchronizing all the

elements of combined arms is communications and coordination on a fluid quick paced battlefield. With superior command and control provided by secure communications the ability to integrate air, artillery, mines, direct fire weapons, and mobile forces is enhanced. The ability to preplan defensive operations and develop contingency operations over the actual terrain increases the possibility of coordination with sister services. This can be done through predesignated target areas and rehearsals. At the operational level a permanent fortification can provide the focal point for the Air Force because they know the enemy force will be converging upon or avoiding the fortification. Fortifications may also be integrated into supporting naval operations by protection of a port facility or amphibious landing area.

Understand the Effect of Battle on Soldiers, Units, and Leaders

It is this imperative which is often used to denigrate the importance of permanent fortification. The failure of the Maginot Line and its effect on the soldiers and leaders of the French Army is usually given as the primary failure of dependence on permanent fortifications.(56) There seems to have developed a conception in the U. S. Army that a maneuver oriented army will become infected with a disease of static position if it uses fortifications. This seems a bit odd as the other maneuver oriented armies find that permanent fortifications are compatible with maneuver. The Soviet Army and the Israeli Army are both maneuver oriented armies but have no trouble integrating the use of permanent fortifications on their frontiers. The Soviets have extensive permanent fortifications along the Sino-Soviet border.(57) However, for the U. S. Army at the operational level the impact of having a fort captured or destroyed with great loss of life is one that must be considered. The American soldier does not want to be put in the

circumstances of an Alamo or Bataan.

Although much has been said of the detrimental effect of the Maginot Line on the morale of the French Army, there is nothing to show that troops in fortifications are more likely to perform poorly. Studies of the Maginot Line's effects on troops' morale suggest the strong defensive positions did not hurt their will to fight. Some of the garrisons of the Line refused to submit to the armistice, and fought on, surrendering only after repeated orders to do so.(58) Soldiers who are convinced they have an advantage over the attacking enemy will be more likely to fight effectively. Permanent fortifications which provide nuclear, biological, and chemical protection should increase morale and fighting spirit. There are many historical examples of beaten armies falling in on prepared fortifications and recapturing their lost fighting spirit.

After examining the ten imperatives of ALB and how permanent fortification might support them for a contingency based army, it is clear permanent fortifications could under the correct circumstances fit within the operational design of a campaign. Permanent fortifications have disadvantages if they are not used within the theoretical framework already discussed in this paper. The key for the U. S. Army is to evaluate when and where permanent fortifications can be economically and efficiently considered.

VI. Conclusions and Implications.

Adherence to dogmas has destroyed more armies and cost more battles than anything in war.

J. F. C. Fuller (59)

The successful use of fixed permanent fortifications at the operational level is viable. Their failure in the past has generally been caused by a lack of understanding of the correct operational design for their use. They alone can not be expected to defeat the enemy without a campaign by a mobile force supporting them. This mobile force should not be confused with mobile tactical reserves used to counterattack breaches in the defensive line. The mobile force must be an operational level size force used in a campaign which is not necessarily designed to defeat immediately penetrations of the permanent fortifications. This operational force campaign design should take advantage of the situation developed by the fortifications, but this may include offensive operations directed far from actual actions at the fortifications. This could include a deep thrust to cut off the entire assault force, allowing a large scale penetration and then cutting it off, or an operation aimed at a center of gravity not directly influencing the assault forces but rather the leadership of the enemy. When the focus of the defensive strategy is for the permanent fortifications to defeat the enemy army, the fortifications will normally fail.

When considering whether permanent fortifications are appropriate, many factors must be considered. The primary consideration will always be cost. The other considerations will normally be rated as to how they effect cost. For instance, the location must be suitable to the defense. This will

depend on what is to be defended -- an area, point, or frontier and the geographic makeup of the area. If the soil will not allow extensive underground construction due to low water tables or subsurface rock formations, then construction of permanent fortifications may be too costly. If the location requires too extensive a system of fortifications because of lack of natural obstacles, the level of fortifications desired may have to be reduced to lessen costs. Also the required technology may be too costly. The Maginot Line suffered from cost overruns which eventually forced a reduction its length.(60)

The issue of cost is also affected by the need for mobile forces even if fortifications are used. With the cost of high-tech weapons continually rising, the choice of dividing funds between fix fortifications and more versatile mobile forces will normally tip toward the versatile one. A contingency oriented army will have to be prepared for as many different situations as possible; therefore, versatility is the key to success when funds are limited.

In a world where political decisions did not override military principles a mobile defense is normally the best defensive strategy. However, that is not the case. For political reasons a static defense may be dictated. While it may make military sense to trade space for time, it is often not politically feasible to incorporate this strategy publically prior to the outbreak of hostilities. Permanent fortifications may be used as a deterrent providing a visibile demarcation to a potential aggressor. The construction of the Maginot Line was as much a political decision as a military one.(61) And once the decision was decided upon it fell upon the French military to make it work militarily. They failed in their mission and the price was a devastating defeat.

The future for the U. S. Army appears to be smaller force which has forward presence and is contingency oriented. It may seem that such a force need not be concern with the use of permanent fortifications at the operational level. Its doctrine and manuals indicate this. FM 100-5, Operations, contains no reference to permanent fortifications. AirLand Battle doctrine is completely offensive and maneuver oriented. While this in fact may be the correct doctrine to employ from a standing start, it completely ingnores the possibility of the use of permanent fortifications. The operational level of war must link strategy with tactics. Should the political decision be made to build permanent fortifications in a particular theater, the U. S. Army has no doctrine for use or construction. There were many persuasive arguments for permanent fortifications on the old Inter-German Border but political realitities made their use a moot point. Should the Kuwaiti government decide to construct permanent fortifications the U. S. Army has no written guidance on how they should be constructed or the proper operations design necessary to insure success. U. S. Army operational art does not consider using fixed permanent fortifications.

Although ignored by U. S. doctrine, there are times when permanent fortifications can provide advantages at the operational level to the defender. The use of coalitions forces is easier to integrate into a static defense than with our mobile forces. The use of permanent fortifications can increase the effectiveness of light infantry against mechanized forces. Permanent fortifications can provide stockpiles of material and maintenance facilities to support deploying forces. Fortifications can provide additional time for deployment to a crisis theater by delaying the enemy assault and providing a safe base for build up of forces.

The dynamics of combat power through history have shown that

technology continually provides offensive means which are eventually countered by defensive means at the tactical level. However, it is the emergence of operational art which tips the offensive as the decisive form of war. Yet even on the offensive, the defense is an inherent part of a successful campaign. The use of fixed permanent fortifications must be rooted in time tested theory and principles, yet forward looking and adaptable to changing technology. The doctrine should be uniform and understood prior to implementation. If the political reality requires a static defense then the military must be able to support the military conditions with the proper operational design which avoids focusing at the tactical level.

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